FILE COPY FOREST INSECT LABORATORY, STANFORD UNIVERSITY CALIFORNIA.

326.26
GC 3.1

S
Insect Control
S.Oregon-N.California.

A. J. Jaenicke.

RESULTS

OF THE

1922 PINE BEETLE SURVEY

OF

KLAMATH AND LAKE COUNTIES, OREGON

EXCLUSIVE OF THE AREA COVERED BY THE

SOUTHERN OREGON-NORTHERN CALIFORNIA CONTROL PROJECT

(Cooperatively carried out by the Klamath Forest Protective Association, the U. S. Indian Service and the U. S. Forest Service)

January, 1923

A. J. Jaenicke,
Forest Service,
Portland, Oregon.

Table of Contents.

	Page
Necessity and purpose of the Survey.	1
Character of the Survey.	5
Results of the Survey.	6
Recommendations.	14
Findings of Survey by Districts.	15
Fort Rock (1)	16
Crescent (2).	17
Paulina (3)	18
Silver Lake (4)	19
Paisley (5)	19
Thomas Creek (6).	20
Warner (7)	21
Pelican Bay (8).	22
Fort Klamath (9)	23
Crater Lake National Park (10).	24
Klamath Indian Reservation (11)	26

Map of Survey Area-opposite page 30.

NECESSITY AND PURPOSE OF THE SURVEY

An epidemic of the western pine beetle of enormous proportions and great severity in the yellow pine of Klamath and Lake counties, Oregon is engaging the careful attention of the various private and government agencies responsible for the protection of the jeopardized timber. This pine beetle epidemic is distributed on an area of 1,300,000 acres of private and government timber, largely yellow pine, and most of it is situated in Klamath and Lake counties, Oregon. The area in question contains 12 billion board feet of living yellow pine. During the ten-year period, 1910-1919 inclusive, the western pine beetle has killed at least 1,200,000 M. board feet or 10 per cent of the yellow pine now living. During 1920 and 1921, a two-year period, this same beetle killed 208,000 M. board feet of yellow pine or 1.7 per cent of the stand. These figures were secured as the result of careful surveys preparatory to the 1922 control operations cooperatively undertaken by the private owners and the Federal Government under the technical advice of the federal Bureau of Entomology. The 1922 control operations cost the private owners $27,000 and the Federal Government $53,000. The 1923 control plan contemplates the expenditure of $31,000 by the private owners and $62,000 by the Federal Government. By the end of 1924,

it is expected that the epidemic situation will have been relieved to such an extent that the pine beetle damage will have been reduced to a very small proportion of what it now is. In fact, the results of the 1922 work are gratifying and seem to more than justify such a conclusion. This situation is indicative of the enormous damage which the western pine beetle can do and the large expense of controlling an infestation of large proportions.

Outside of the boundaries of the Southern Oregon-Northern California pine beetle control project there is in Klamath and Lake Counties a timbered acreage, privately and federally owned, of 3,307,000 acres containing a stand of 17,390,000 M. board feet of yellow pine. It is proposed on this area to prevent the development of a serious and wide-spread pine beetle epidemic such as is now being successfully arrested at a large but justifiable cost in the remaining portions of Klamath and Lake Counties. The prevention of such an epidemic is possible only by annually carrying on a survey which will enable the prompt detection of the rise of any conditions which presage destructive pine beetle activity. It is evident that by fighting a pine beetle infestation in its incipiency not only can much timber be saved from loss, but effective control measures are much cheaper because of the smaller volume of infested timber which must be felled, peeled and burned. An adequate annual pine beetle survey is to pine

beetle protection what prompt detection is to an effective fire protection program.

The 1922 pine beetle survey of the yellow pine timber in Klamath and Lake Counties outside of the boundaries of the present control project was, therefore, undertaken at the instance of the Klamath Forest Protective Association as a preventive measure. A sufficiently accurate analysis of the pine beetle situation was possible as a result of the survey to justify safe conclusions on the progress and amount of the existing pine beetle activity and to single out the danger zones which are in need of special watching.

The area covered by the survey and the area included by the pine beetle control project are indicated by a map which follows the last typed page of this report. No description of the conditions on the pine beetle control project will be included in this report since they are adequately discussed in a special report already prepared and available. This report will deal only, therefore, with the yellow pine areas in Klamath and Lake Counties outside of the pine beetle control project and the term "survey area" will be used in this report to designate only the area included by the survey under discussion.

Briefly, then, this extensive pine beetle survey was conducted as the first of the annual reconnaissances which are to be made for the following purposes:

1. To detect the development of any dangerous pine beetle conditions and thus prevent the

occurrence of large destructive pine beetle outbreaks which destroy much timber and are both difficult and expensive to control.

2. To ferret out from time to time the situations in various parts of the area which need special and more detailed observations.

3. To gather the basic data on which a permanent pine beetle protection plan of greatest efficacy and least cost can be based. Such data include the division of the area into permanent beetle protection districts, the determining of boundaries of those areas which are especially menaced by beetle activity because of fires or heavy windfall, etc.

4. To secure the interest of all private and government agencies responsible for the protection of the timber.

If the survey is conducted annually and with reasonable thoroughness, it is reasonable to expect that the development of large and severe beetle epidemics can be averted by the prompt detection and suppression of every dangerous outbreak.

CHARACTER OF THE SURVEY

The writer, with an assistant and automobile transportation furnished by the Klamath Forest Protective Association and the help of local officers of the Forest Service and the full cooperation of the Indian Service, spent ten weeks during the late summer and fall of 1922 in observing the beetle conditions in various parts of the survey area. The methods used in the survey were those developed by the Bureau of Entomology in previous pine beetle surveys. The work consisted mainly in actually seeing as much of the timber as possible by traveling through it and supplementing these observations by frequently climbing to high points from which, with the aid of powerful field glasses, the frequency and distribution of the recently killed trees could often be seen for considerable distances. These observations resulted in reasonably reliable data on the amount of timber which was being killed, the location of the heaviest centers of infestation, recent increases or decreases in pine beetle activity and such other data as are needed to determine whether or not control measures are or may be desirable. By chopping into infested trees from time to time, evidence was obtained as to the health and numbers of the beetles which may be expected to emerge and attack green timber during the spring of 1923.

Results of the Survey

No where on the survey area was the 1922 pine beetle situation as serious as that within the epidemic portions of the existing control project. Furthermore, the survey revealed no areas on which the character and severity of the pine beetle damage justify immediate control measures.

As a result of the survey, the area was divided into eleven districts. By making use of all available records, estimates were made of the private acreage, the government acreage and the yellow pine stand for each of these eleven districts. This information is desirable to serve as a basis for determining the relative responsibilities of the government and the private owners in any beetle protection program for the several districts. The preliminary inventory of the yellow pine resources within the districts are needed to emphasize the great timber values which are involved in this survey and those which are annually to follow. Both the acreage figures and the yellow pine estimates are rough approximations and are much in need of careful revisions as more data become available.

On the map which follows the last page of this report, the boundaries of the eleven districts are indicated. The ownership, acreage and volume situation for these eleven districts is as follows:

Private acreage	962,000 acres.
Government acreage	2,345,000 acres.
Total acreage	3,307,000 acres.

Total yellow pine volume in board feet (Private and government)	17,390,000 M.

Of the 2,345,000 acres under government ownership, 900,000 acres are within the Klamath Indian Reservation. Nearly all of the remaining 1,530,000 acres of government timber are portions of the Deschutes, Fremont and Crater National Forests.

Of the 3,307,000 acres within the survey area, it is quite likely that not more than 2,500,000 acres contain commercial stands of yellow pine. With the completion of timber surveys now in progress on both government and private lands, it will be possible to eventually secure more accurate information on this point.

The following table gives the ownerships, acreages and yellow pine volumes by districts:

Table 1

Ownerships and Yellow Pine Volumes within Survey Area.

Name of District*	Timbered Acreages			Total Yellow Pine Volume in M. feet B.M. Private and government
	Private	Federal	Total	
Fort Rock	150,000	176,000	326,000	1,650,000
Crescent	205,000	327,000	532,000	2,650,000
Paulina	236,000	140,000	376,000	840,000
Silver Lake	102,000	114,000	216,000	1,500,000
Paisley	53,000	172,000	225,000	1,100,000
Thomas Creek	41,000	84,000	125,000	710,000
Warner	51,000	82,000	133,000	1,060,000
Pelican Bay	8,000	132,000	140,000	600,000
Fort Klamath	31,000	144,000	175,000	1,280,000
Crater Lake National Park	0	159,000	159,000	No estimate
Klamath Indian Reservation	85,000	815,000	900,000	6,000,000
Totals	962,000	2,345,000	3,307,000	17,340,000

* See map at end of report for boundaries of districts.

It is estimated that in 1921 the pine beetle damage in the survey area resulted in the death of forty million board feet of good quality of yellow pine in the form of trees with an average volume of 700 to 900 board feet per tree. This is equivalent to less than one-fourth of one per cent of the total yellow pine stand on the area. The 1921 loss was greatest in the Paisley district where it averaged 45 yellow pine trees per section or four-tenths of one per cent of the stand. The beetle loss for 1921 was least in the yellow pine of the Crater National Park where it averaged 10 trees per section or one-tenth of one per cent of the yellow pine stand. In this connection, it is interesting to note that the 1921 pine beetle loss in the timber within the control project averaged seven-tenths of one per cent of the stand, a loss three times as severe as that on the survey area.

In Table 2 the 1921 pine beetle loss is summarized by districts. The table gives the yellow pine volume killed in 1921, the average number of trees killed per section and the per cent of the pine stand killed in 1921.

Table 2

1921 Beetle Damage* in Yellow Pine

Name of District	Yellow Pine Volume killed in 1921 M. feet B.M.	No. of Y.P. Trees killed per section in 1921 in Commercial Y.P. stands	Per Cent of Volume of Yellow Pine Stand killed in 1921
Fort Rock	3,300	20	0.2 of 1 per cent
Crescent	3,975	15	0.15 " " "
Paulina	1,680	20	0.2 " " "
Silver Lake	3,750	25	0.25 " " "
Paisley	4,400	45	0.4 " " "
Thomas Creek	1,775	25	0.25 " " "
Warner	2,120	20	0.2 " " "
Pelican Bay	1,500	25	0.25 " " "
Fort Klamath	2,560	20	0.2 " " "
Crater Lake National Park	No estimate	10	0.1 " " "
Klamath Indian Reservation	15,000	25	0.25 " " "
Totals	40,060	--	0.23 of 1 per cent

* Not till the spring of 1923 is it possible to estimate the complete 1922 damage. Only the 1921 loss can be estimated at this time.

The infestation even in any one district is not uniformly distributed. Parts of a district frequently show a loss very much in excess of that given as the average per section. However, no where on the survey area, with the exception of parts of the Paisley and Fort Rock districts, does the 1921 pine beetle loss even approximate the damage on the control project. An no where on the survey area are there today such heavy and dangerous concentrations of pine beetle activity as are prevalent on parts of the present control project.

The situation on the Paisley district needs careful watching for, although there are evidences of rapid decline in beetle activity within the past year, the existing infestation may soon again develop into a real menace. In the Fort Rock district, forest fires have been responsible for increased beetle damage. Although the 1921 beetle loss for the district is quite low, there are still indications that the impetus which forest fires have given the beetles is not entirely absent. Therefore, the Fort Rock district is worthy of special attention.

In a latter section of this report, the present status of the pine beetle problem will be discussed separately for each of the eleven districts but a summary of the findings of the survey may be in order here. The results may be stated as follows:

1. The survey covers 3,307,000 acres containing a stand of 17,390,000 M. board feet of yellow pine exclusive of other species. About 30 per cent of this area and a greater proportion of the timber is in private ownership.

2. Although there are various species of trees on the survey area other than yellow pine, only the insect situation in yellow pine is worthy of attention. It is believed that the occasional heavy infestations now in lodgepole by the mountain pine do not menace the adjacent yellow pine.

3. Practically all of the insect losses in yellow pine are due to the western pine beetle (Dendroctonus brevicomis). In 1921 this loss amounted to an average of less than one-fourth of one per cent of the stand, a loss which is not much in excess of what might be termed normal or endemic loss. This loss amounts to 40,060 M. board feet of yellow pine.

4. No where on the survey area are the beetle conditions such that control measures are warranted now but there are two districts, the Fort Rock and Paisley districts, which need careful watching.

5. In various parts of the area, forest fires have been responsible to a considerable degree for past beetle activity. Absolute fire protection, such as is now given all of the government timber and most of the private timber, is needed in any effective plan of protection against beetle damage.

6. In general, the pure yellow pine stands are much more heavily attacked by the western pine beetle than those yellow pine stands where there is a considerable admixture

of other species. Unfortunately, therefore, the invaluable commercial stands are subject to the biggest beetle damage.

7. The private lands and the government lands are so closely intermixed that any plan of protection must include the lands in both classes of ownership.

Recommendations

In the writer's opinion, the data revealed by the 1922 beetle survey justify emphasis on the following recommendations:

1. In order to prevent the development of a destructive pine beetle epidemic, it is imperative that a survey be conducted annually.

2. Because of the close inter-relationship of the timber lands under various classes of ownership, it is necessary that such surveys be conducted cooperatively by the private owners, the U. S. Indian Service and the U. S. Forest Service. Only in this way can the data be comparable for the various areas.

3. Because of the manner in which fires of all classes of severity contribute to the increase of the destruction of yellow pine by the western pine beetle, the absolute protection against fire which is now generally in vogue is highly recommended from the beetle protection standpoint.

4. The status of the beetle infestation on the Paisley and Fort Rock districts calls for more intensive examination in 1923 than the other districts in the survey area.

5. Subject to concurrence by the Bureau of Entomology, no control measures are now recommended for any district in the survey area.

Findings of Survey by Districts

In the preceding portions of the report, a general description of the status of the beetle situation on the entire survey area was given. In many cases, private owners are interested in the conditions in only one or two districts. For their convenience a brief summary of each of the eleven districts is given here. The reader is again referred to the map attached to this report. On this map the boundaries of the various districts are marked in red. The boundaries of the Southern Oregon-Northern California pine beetle control project are indicated in blue. The survey area and the control project together include all of the yellow pine timber in Klamath and Lake Counties, Oregon.

For each district the average number of trees killed per section is given. These trees average in volume from 700 to 900 board feet.

The infestations can be classed as being either normal or epidemic. The normal infestations are those which are at a low ebb, which are more or less quiescent and which, therefore, are not considered to be a menace. The epidemic infestations, on the other hand, are those in which the losses are more severe and in which the beetles are aggressive in killing thrifty, vigorous trees. Epidemic infestations are, as a consequence, a menace to living timber. Epidemics may be either of an increasing or decreasing character. Occasionally epidemics are encountered which are temporarily balanced, that is neither

increasing nor decreasing. A balanced epidemic is merely a smouldering one and requires just as careful attention as an increasing epidemic. An infestation may, therefore, belong to one of four classes, namely:

Normal.
Decreasing Epidemic.
Balanced Epidemic.
Increasing Epidemic.

The infestations in the eleven districts will be divided into these four classes. However, it should be remembered that the epidemic infestations on the survey area are several times less severe than those within the boundaries of the present pine beetle control project.

Fort Rock district (1)

This district has a total timbered area of 326,000 acres of which 150,000 acres are in private ownership and 176,000 acres are within the Deschutes National Forest. The yellow pine stand is estimated at 1,650,000 M. board feet.

The 1921 pine beetle loss is estimated at 3,300 M. board feet or two-tenths of one per cent of the yellow pine stand. In 1921 from 10 to 60 trees per section were killed. The average loss was 20 trees per section. The infestation is classified as a balanced epidemic.

During the past ten years there have been a number of fires in both private and government timber. It is on

these burns that the heaviest beetle losses are now concentrated. In many cases the yellow pines immediately adjacent to the burns are remarkably free of infestation.

Extremely severe infestations by the mountain pine beetle are ravaging some of the lodgepole forests but they are not believed to be a menace to the adjoining yellow pine timber.

The situation on this district demands careful attention because of the concentrated infestations on the burned areas and the uncertainty as to what the future behavior of these attacks will be.

Crescent (2)

This district has a total timbered area of 532,000 acres of which 205,000 acres are in private ownership and 327,000 acres are within the Deschutes National Forest. The yellow pine stand is estimated at 2,650,000 M. board feet.

The 1921 beetle loss in yellow pine is estimated at 3,975 M. board feet or fifteen one-hundredths of one per cent of the stand. In 1921 from 10 to 40 trees per section were killed. The average loss was 15 trees per section. The infestation is classified as normal.

This district contains a few small foci of heavy infestation in yellow pine but these are showing evidences of extremely rapid decline. Nevertheless they will be carefully watched.

Perhaps less than one-third of this district is covered by pure yellow pine stands. The remainder of the district consists largely of white fir, mountain hemlock and lodgepole. Several bodies of lodgepole are suffering severely from attacks by the mountain pine beetle. These infestations will be bad fire traps within the next four or five years when the beetles will have killed much of the lodgepole and the trees now killed are windthrown.

Paulina (3)

This district has a total timbered area of 376,000 acres of which 236,000 acres are in private ownership and 140,000 acres are largely a part of the Fremont and Deschutes National Forests. The yellow pine stand is estimated at 840,000 M. board feet.

The 1921 beetle loss in yellow pine is estimated at 1,680 M. board feet or two-tenths of one per cent of the stand. In 1921 from 10 to 30 trees per section were killed. The average loss was 20 trees per section. The infestation is classified as normal.

This district contains large bodies of lodgepole some of which are now being heavily attacked by the mountain pine beetle. About 8 years ago the yellow pine in the south-eastern part of the district, especially in the vicinity of Embody's mill, was severely damaged by the western pine beetle but after considerable destruction of timber, the former activity of the beetles has been replaced by a quiescent normal infestation.

Silver Lake (4)

This district has a total timbered area of 216,000 acres of which 102,000 acres are in private ownership and 114,000 acres are largely a part of the Fremont National Forest. The yellow pine stand is estimated at 1,500,000 M. board feet.

The 1921 beetle loss in yellow pine is estimated at 3,750 M. board feet or one-fourth of one per cent of the stand. In 1921 from 10 to 50 trees per section were killed. The average loss was 25 trees per section. The infestation is classed as a high normal infestation.

The district contains bodies of yellow pine of high quality and although the infestation averages 25 trees per section, the present attacks are in the form of widely scattered over-mature trees and there is every evidence that a decline in the attacks is imminent. The heaviest infestation is on the eastern slopes of the so-called Winter Rim but this infestation is quite local and is in a stand of timber of low quality. The possibility of the extension of the Winter Rim infestation to the westward so as to threaten the main body of yellow pine makes this situation worth watching with special care.

Paisley (5)

This district has a total timbered area of 225,000 acres of which 53,000 acres are in private ownership and

172,000 acres are a part of the Fremont National Forest. The yellow pine stand is estimated at 1,100,000 M. board feet.

The 1921 beetle loss in yellow pine is estimated at 4,400 M. board feet or four-tenths of one per cent of the stand. In 1921 from 15 to 60 trees per section were killed. The average loss was 45 trees per section. The infestation is classified as a balanced epidemic.

The heaviest infestation in the survey area was found in this district. Much of the yellow pine in the Chewaucan basin is of high quality and it is in this class of timber that the infestation is concentrated. A few years ago the trees were being killed in groups. The fact that much of the infestation is now in the form of scattered trees may indicate the advent of a marked decline in the severity of the attacks in the near future. This infestation demands detailed study as early during 1923 as weather conditions permit field work.

The western portions of the District contain much lodgepole but at present it is not suffering from the mountain pine beetle to the same extent as the lodgepole in the Fort Rock, Crescent, Paulina and Silver Lake districts.

Thomas Creek (6)

This district has a total timbered area of 125,000 acres of which 41,000 acres are in private ownership and 84,000 acres are a part of the Fremont National Forest. The

yellow pine stand is estimated at 710,000 M. board feet.

The 1921 beetle loss in yellow pine is estimated at 1,775 M. board feet or one-fourth of one per cent of the stand. In 1921 from 10 to 35 trees per section were killed. The average loss was 25 trees per section. The infestation is considered a normal one.

Much of the timber in this district is decidedly mature and this may account for the relatively high average loss per section. Many of the trees which are attacked are stag-headed, decadent trees which are apparently of low resistance. At any rate, the infestation in this district is at present relatively inactive. There is much evidence of the existence of a destructive epidemic infestation in yellow pine a number of years ago.

Warner (7)

This district has a total timbered area of 133,000 acres of which 51,000 acres are in private ownership and 82,000 acres are a part of the Fremont National Forest. The yellow pine stand is estimated at 1,060,000 M. board feet. Much of the timber is of particularly high quality.

The 1921 beetle loss in yellow pine is estimated at 2,120 M. board feet or two tenths of one per cent of the stand. In 1921 from 10 to 30 trees per section were killed. The average loss was 20 trees per section. The infestation is classified as normal.

The heaviest infestation is on the rocky south exposures where the timber is short and occurs in very open

stands. Much of the better quality of yellow pine is in mixture with other species and in these mixed stands the yellow pine is remarkably free at present from western pine beetle attacks. Nevertheless there is abundant evidence of severe beetle damage perhaps ten years ago, a fact which indicates the possibility of the recurrence of such an epidemic.

Pelican Bay (8)

This district has a total timbered area of 140,000 acres of which 8,000 acres are in private ownership and 132,000 acres are a part of the Crater National Forest. Practically all of the yellow pine is in the eastern half of the district. The remainder of the district consists largely of Douglas fir, Shasta red fir, and white fir. The yellow pine stand is estimted at 600,000 M. board feet.

The 1921 pine beetle loss is estimated at 1,500 M. board feet or one-fourth of one per cent of the stand. In 1921 from 15 to 30 trees per section were killed. The average loss was 25 trees per section. The infestation is classified as normal.

In those portions of the district where logging operations have been going on, the virgin stands adjoining the cutting areas are fairly free from damage. Parts of the district have been visited a number of times during the past ten years by cyclonic winds which uprooted much green timber. In the vicinity of these windfalls, there is more

infestation than elsewhere in the living timber. However, the beetle situation in the district is at present not a disturbing one. Continuous logging operations will do much to protect the nearby virgin timber from beetle depredations since the beetles are attracted to the constantly renewed supply of logging debris.

Fort Klamath District (9)

This district has a total timbered area of 175,000 acres of which 31,000 acres are in private ownership and 144,000 acres are a part of the Crater National Forest. The yellow pine stand is estimated at 1,280,000 M. board feet.

The 1921 pine beetle loss is estimated at 2,560 M. board feet or two-tenths of one per cent of the yellow pine stand. In 1921 from 10 to 30 trees per section were killed. The average loss was 20 trees per section. The infestation is a normal one.

There are two factors which are influencing insect conditions in this district. In the first place more or less cutting in various parts of the district has had a tendency to keep down the infestation in nearby virgin stands because of the continued breeding of the beetles in the logging debris in preference to breeding in living timber. In the second place, recent fires of considerable extent may yet result in a concentration of the beetles on the burns and ultimately result

in beetle losses of greater severity than are now going on in the district. For this reason, the beetle situation here is worthy of special observation. Within the past two years, windfalls in yellow pine timber have resulted in making available breeding places for the western pine beetle and enabling them to concentrate in large numbers. Whether the emergence of the beetles from these windfalls will be followed by an attack of standing timber nearby in the absence of a further supply of green down material can not be predicted but it is certain that windfall areas should be watched as being a possible beetle menace to living trees in the vicinity.

In this district, and in the Pelican Bay district as well, there exists an occasional practice of leaving sawlogs in the woods long enough to permit both the breeding and emergence of the western pine beetle. During the period April 1 and September 1, sawlogs should not be permitted to remain in the woods over six weeks. Logs cut after September 1 may be permitted to remain in the woods over six weeks. Logs cut after September 1 may be permitted to remain in the woods all winter but they should be removed not later than the first of June. The following of this precedure will remove all possible danger of attack of living timber by beetles emerging from infested logs.

Crater Lake National Park (10)

This district has a total timbered area of 159,000 acres. In the extreme southeastern part of the Park and within

the boundaries as shown on the map, there is a privately owned body of timber of several thousand acres. With this exception, the 159,000 acres are under federal control. No estimate is available on the yellow pine stand in the district.

The 1921 pine beetle loss is estimated to be not more than one-tenth of one per cent of the yellow pine stand. Not only are the yellow pine losses now at a low ebb but there is but little evidence of any recent epidemic of severity. Much of the yellow pine in the Park, and there is not a large quantity of it, is in mixture with other tree species. In fact, with the exception of the privately owned timber in the southeastern portion of the district, yellow pine is rarely predominant in the forests of this district. As is also evident in other districts in the survey area, the yellow pine in the mixed stands is suffering far less from pine beetle depredations than the yellow pine in the pure or nearly pure bodies. The infestation in this district is decidedly at a low normal stage.

In the northern part of the district there are extensive stands of lodgepole. During the past two years, there have developed heavy infestations by the mountain pine beetle which cover thousands of acres. These attacks extend to the north into the Umpqua National Forest. Eventually these areas will become fire hazards because of the large volumes of dead timber which will result from the activity of the mountain pine beetle.

Klamath Indian Reservation (11)

That portion of the Klamath Indian Reservation north of the Sprague River and west of the Sycan River includes 900,000 acres. Approximately 85,000 acres of this total are included in what is known as the Long-Bell tract. The remaining 815,000 acres are made up of both the individual and tribal allotments. On these 900,000 acres there is an estimated yellow pine stand of 6,000,000 M. board feet.

The part of the Klamath Indian Reservation south of the Sprague River and east of the Sycan River is within the boundaries of the Southern Oregon-Northern California pine beetle control project. This portion of the Reservation has a timbered acreage of 255,000 acres and a yellow pine volume of almost two billion board feet. It has been covered by very careful beetle surveys conducted by the Bureau of Entomology and during 1922 considerable control work was done in the more heavily infested timber. Reports on the status of the the beetle infestation in this timber is described in detail in reports already issued by the Bureau of Entomology.

11 Unfavorable weather conditions made it impossible to make an adequate survey of the 900,000 acres of the Indian Reservation which is not included in the present boundaries of the pine beetle control project. On the basis of the limited field work, sufficient data were not secured to subdivide this large area into districts.

In the course of the timber reconnaissance conducted during the past two years by the Indian Service, data were incidentally secured by field parties on the severity of the pine beetle losses in various parts of the Reservation. These data have not yet been compiled and although they will be of no value in indicating the trend or status of the existing infestation, they will reveal the location of the heaviest centers of past losses and thus set out certain areas which may still be in need of careful attention.

Since 1919 the Colorado Pandora moth has defoliated part of the yellow pine on at least 300,000 acres on the Reservation. The caterpillars have completely eaten off the needles of thousands of trees and although very little timber has been killed by this injury, undoubtedly the trees are left in such a weakened condition that they are much more liable to succumb to fires and are less able to resist the attacks of the western pine beetle. At the present time, the defoliated timber does not appear to be suffering more from beetle attacks than the yellow pine of unimpaired vigor. Whether this immunity will continue can not be predicted. Fortunately there is some evidence that the Colorado Pandora moth activity is on the wane.

Parts of the Reservation have been scarred by big fires within the last ten years. On some of the more recent burns there is evidence of increased pine beetle activity immediately after the fires but in no case do these attacks yet appear to be dangerous.

The pine beetle infestation on the Long-Bell tract is at present more or less quiescent and the 1921 damage probably does not average more than 20 trees per section.

The pine beetle damage for 1921 on the entire Reservation outside of the existing control project boundaries and including the Long-Bell tract and the individual and tribal allotments, is estimated at 15,000 M. board feet, or one-fourth of one per cent of the yellow pine stand. The infestation is not in an epidemic condition but it is too heavy to be considered a normal loss. The beetle situation on the Reservation warrants more study and it is not unlikely that further work will reveal epidemic areas of considerable extent. Generally speaking, however, the pine beetle activity north of the Sprague River is very much less severe than the pine beetle damage south of the Sprague River.

THE BOUNDARIES OF THE SOUTHERN OREGON-NORTHERN CALIFORNIA PINE BEETLE CONTROL PROJECT AND THE AREA COVERED BY THE 1922 PINE BEETLE SURVEY

Oregon Boundaries of Southern Oregon-Northern California Pine Beetle Control Project.

Timbered Areas Outside of Pine Beetle Control Project but within Klamath and Lake Counties-as covered by the 1922 Pine Beetle Survey. The 1922 Survey Area is divided into the following 11 Districts:-

Deschutes National Forest and Adjoining Private Timber:-

Fort Rock District (1)
Crescent District (2)

Fremont National Forest and Adjoining Private Timber:-

Paulina District (3)
Silver Lake District (4)
Paisley District (5)
Thomas Creek District (6)
Warner District (7)

Crater National Forest and Adjoining Private Timber:-

Pelican Bay District (8)
Fort Klamath District (9)

Crater Lake National Park (10)
Klamath Indian Reservation (11)

January, 1923.

A. J. Jaenicke,
Forest Service,
Portland, Oregon.